SPECIFICATION

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PATCH FOR FLEXIBLE CONTAINER

Background of the Invention

[0001] This invention relates to filling flexible containers, and particularly to aseptically filling such containers. Flexible polymeric containers are well known for storing and dispensing wine, dairy products, enteral feeding solutions, fruit juices, tea and coffee concentrates, puddings, cheese sauces, and many other flowable materials, including those that must be filled aseptically. These generally include low acid materials. Flexible polymeric containers typically have walls made of polymeric films with either a monolayer or multiple layer structure. The particular polymers constituting the container film layers vary depending on the type of material to be placed in the container. The film layers may also include an oxygen barrier material layer to prevent contact between such materials and oxygen or other gas sensitive contents. The walls of the containers may be metallized, or coated with a metallic layer such as aluminum to prevent incursion of oxygen or other gases. A separate metallized enclosure may also encase the polymeric container.

[0002] The flexible polymeric containers have inlets and/or spouts for filling and dispensing the container contents. The containers are also often placed within a box. The spout extends through an opening in the box to dispense the contents. Such packaging systems are commonly referred to as "bag-in-box."

[0003] Filling equipment used to aseptically fill flexible containers is well known in the art. Prior art examples include U.S. Patent No. 4,519,184, to Brunswick; U.S. Patent No. 4,942,716 to Anderson; and U.S. Patent No. 4,805,378 to Anderson. In particular, U.S. Patent No. 4,805,378 (the '378 Patent), incorporated by reference as though made a part hereof, discloses a method and system for aseptically filling flexible

containers. The '378 Patent discloses a system and method in which the container inlet is covered by a rupturable closure. The rupturable closure is broken to fill the container. The inlet has a heat sealable flap located opposite the rupturable closure. After filling, the inlet is closed by heat sealing the flap to the interior of the inlet.

[0004] It has been found that the '378 Patent method and apparatus works well with containers having an outer metallized layer or separate metallized enclosure. The metallized layer or enclosure dissipates heat created by the heat sealing. However, heat applied directly to polymeric containers lacking the metallized layer or enclosure does not dissipate, and unacceptably compromises the integrity of the container by weakening it in the area where the heat is applied.

Summary of the Invention

[0005] In one embodiment, the present invention provides a container system for flowable materials including a front wall having an inner surface and an outer surface, and a back wall having an inner surface and an outer surface. There is an opening in the front wall. The invention further provides a patch attached to the back wall of the container opposite and in substantial registration with the opening.

[0006] In another embodiment, the present invention provides a multilayer film patch. The film patch includes a first layer of polyester or polyamide, and a second layer of polyethylene. In a further embodiment, the present invention provides a multilayer film patch including a metallized inner layer or an inner layer of polyamide, a first outer layer, a second outer layer.

[0007] In a still further embodiment, the present invention provides a method of filling a flexible container including the steps of providing a flexible container, the container having a front wall, the front wall having an inner surface and an outer surface. The front wall has an opening. The container also has a back wall. The back wall includes an inner surface and an outer surface. The method also includes providing a fitment assembly accommodated in the opening in the front wall. The fitment assembly has a flange attaching the fitment assembly to the front wall. The flange includes a heat sealable membrane attached to the flange.

[0008] The method further includes attaching a patch to a portion of the outer surface of

the container back wall, bringing at least part of the inner surface of the portion of the container back wall to which the patch is attached into contact with the heat sealable membrane. Additionally, the method includes applying heat to the patch while the inner surface of the back wall is in contact with the heat sealable membrane to seal the membrane to the flange.

[0009] Alternatively, the method of the present invention provides attaching the patch to the inner surface of the container back wall, and bringing at least part of the patch into contact with the heat sealable membrane. The method also provides applying heat to the container back wall while the patch is in contact with the heat sealable membrane to seal the membrane to the flange.

[0010] Yet another embodiment of the present invention provides a method of filling a flexible container including the steps of providing a flexible container, the container having a front wall. The front wall has an inner surface and an outer surface, and an opening. The container also has a back wall with at least a first layer and a second layer. The method also includes providing a fitment assembly accommodated in the opening in the front wall. The fitment assembly includes a flange attaching the fitment assembly to the front wall. The flange also has a heat sealable membrane attached to the flange.

[0011] The method further includes positioning a patch between the first layer and second layer of the container back wall, and bringing at least part of the back wall into contact with the heat sealable membrane. Lastly, the method includes applying heat to the container back wall while the first layer of the back wall is in contact with the heat sealable membrane to seal the membrane to the flange.

[0012] The present invention protects and strengthens the back wall of the container to prevent compromising the integrity of the back wall through the application of heat to heat seal the flange. Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the figures.

Brief Description of the Drawings

[0013] Figure 1 is a schematic side view of a container system of an embodiment of the

present invention prior to filling.

[0014] Figure 2 is a second schematic side view of a container system of an embodiment of the present invention after filling.

[0015] Figure 3 is a schematic side view of a fitment assembly used in an embodiment of the present invention.

[0016] Figure 4 is a schematic bottom view of a fitment assembly used in an embodiment of the present invention.

[0017] Figure 5 is a schematic side view of an embodiment of the patch of the present invention.

[0018] Figure 6 is a schematic side view of another embodiment of the patch of the present invention.

[0019] Figure 7 is a schematic side view of a further embodiment of the patch of the present invention.

Detailed Description of the Invention

[0020] Figure 1 shows a container system 10 including an embodiment of the present invention. The container system 10 includes a fitment assembly 12, a flexible container 14, and a patch 16. Figure 1 shows the container system 10 prior to filling the flexible container 14.

[0021] The flexible container 14 has a front wall 18 and a back wall 20. The front wall 18 has an inner surface 22 and an outer surface 24. The back wall 20 has an inner surface 26 and an outer surface 28. The front wall 18 and back wall 20 of the flexible container 14 are sealed along their periphery 30. The flexible container 14 can be formed by placing the front wall 18 and back wall 20 into registration and sealing the front wall 18 and back wall 20 together along their periphery 30 to form a liquid tight chamber 31. Any suitable means to attach the front wall 18 and back wall 20 may be used, but they are preferably heat sealed. It is also contemplated that the flexible container 14 can be fabricated using a blown tube extrusion process where longitudinal ends of the tube are sealed to form the liquid tight chamber.

[0022] The front wall 18 and back wall 20 may be of any suitable material depending on the contents to be stored in the flexible container 14. Preferably, the front wall 18 and back wall 20 are formed from a polymeric material such as polyethylene, polyvinyl chloride (PVC), polyolefins, polyamides, polyesters, ethylene vinyl acetate (EVA) to name but a few. The front wall 18 and back wall 20 can be monolayer structures or multiple layer structures. The multiple layer structures can be formed by coextrusion, extrusion, lamination, extrusion lamination, or other processes well known in the art. In a preferred embodiment, the front wall 18 and back wall 20 are made of a single layer of polyethylene. In another embodiment, the front wall 18 and back wall 20 are made of two laminated layers of polyethylene. The front wall 18 has an opening 32 generally centrally disposed on the front wall 18 that accommodates the fitment assembly 12. The opening 32, however, may be suitably located anywhere within the front wall 18.

[0023] Figure 3 shows a side view of the fitment assembly 12 in an embodiment of the present invention. The fitment assembly 12 has spout 34, and a base 38 defining a passageway 36 (Figure 4). In a preferred form of the invention, the base 38 is flat and generally rectangular shaped, but may be of any suitable shape such as circular. The base 38 has a front surface 46 and a back surface 48. The base 38 is attached to the inner surface 22 of the front wall 18 at the front surface 46. Preferably attached to the back surface 48 of the base 38 is a heat sealable membrane 50. The heat sealable membrane 50 has a sealing surface 52 and an other surface 54. The heat sealable membrane 50 can be a monolayer or multiple layer structure. The heat sealable membrane 50 is preferably rectangular in shape and initially attached to the back surface 48 of the flange 38 by heat sealing the heat sealing surface 52 to the back surface 48 of the base 38 at points 56 and 58. The heat sealable membrane 50 preferably covers enough of the back surface 48 of the base 38 to overlie the passageway 36. Edges 60 and 62 of the heat sealable membrane 50 are not initially attached to the back surface 48 to permit the flexible container 14 to be moved away from the base when impacted by a flowable material filled through the fitment assembly 12.

[0024] The spout 34 has a generally circular cross-sectional shape, but may be of any suitable shape such polygonal or oval. The spout 34 is generally centrally disposed on

the base, and preferably extends in a perpendicular direction from the base 38. Disposed and spaced along the length of the spout 34 are a first flange 42 and a second flange 44. The first flange 42 is located at a second end 45 of the spout 34 opposite the base 38. The second flange 44 is located at a suitable position between the base 38 and the first flange 42. The first flange 42 and second flange 44 extend around the circumference of the spout 34, and are integral with the spout 34. The first flange 42 is preferably wider than the second flange 44. The first and second flanges 42 and 44 may accommodate docking to filling equipment, or a fluid access device such as a dispenser accommodated in the passageway 36. A third circumferential flange 47 is integral with the base 38.

[0025] Attached to the first flange 42 is a rupturable seal 64. The rupturable seal 64 conforms to the shape of the spout 34 to cover the entire second end 45 and overlie the passageway 36. The rupturable seal 64 is pierced when the flexible container 14 is filled. The rupturable seal 64 is made of any suitable material, but is preferably made of the same materials as the heat sealable membrane 50, and can be a monolayer or a multiple layer structure. After the flexible container 14 is filled, a cap (not shown) is placed over the second end 45 of the spout 34 to seal passageway 36.

[0026] The spout 34, base 38, and first and second flanges 42 and 44 are made of any suitable material, but are preferably made of rigid polymeric materials and more preferably are selected from polypropylenes, high density polyethylenes, polyamides, polycarbonates, polyesters, polyester ethers, polyester elastomers, polystyrenes, acrylonitrile butadiene styrene block copolymers (ABS), polyethylene terephthalate or other rigid polymeric material that can be heat sealed to front wall 18 of the flexible container 14. Suitable materials for the heat sealable membrane 50 include polyolefins, ethylene vinyl acetate copolymers, PVC, polyamides, polyesters, or any other polymeric material that is adhesively compatible with the base 38 and is capable of being heat sealed thereto. In one preferred form of the invention, the heat sealable membrane 50 is a two-layer film structure having a first layer made of a suitable material for sealing to the back surface 48 of the base 38, and a second layer that does not readily seal to inner surface 26 of the back wall 20 of the flexible container 14.

[0027] The patch 16 is preferably attached to the back wall 20 of the flexible container 14. The patch 16 is preferably generally rectangular, but may be any suitable shape. In one preferred embodiment, the patch 16 is attached to the outer surface 28 of the back wall 20 (Figures 1 and 2). The patch 16 is positioned on the outer surface 28 such that it is opposite and in substantial registration with the opening 32 and the base 38 of the fitment assembly 12. The patch 16 is also preferably of a surface area less than the surface area of the back wall 20.

[0028] The patch 16 is preferably a two-layered polymeric film structure. In a preferred form of the invention, the patch 16 includes a first layer 66 of a polyamide, preferably nylon. In another preferred embodiment, the first layer 66 is of polyester. In another embodiment, the first layer 66 is metallized.

[0029] The patch 16 also includes a second layer 68 of a polyethylene. The second layer 68 is preferably made of a homopolymer of polyethylene, and preferably low density polyethylene. The second layer 68 also is preferably approximately 0.0005 inches thick and is extrusion coated onto the first layer 66. In another embodiment, the patch 16 includes an additional metallized layer 73 attached to the first layer 66 opposite the second layer 68 (Figure 5). The metallized layer 73 acts to dissipate heat from the heat sealer 78. The metallized layer preferably includes aluminum.

[0030] The second layer 68 has an inner surface 70 and an outer surface 72. The inner surface 70 contacts the first layer 66. The outer surface 72 of the second layer 68 has at least one, but preferably a pair of adhesive beads 74. The adhesive beads 74 attach the patch 16 to a portion 76 of the outer surface 28 of the back wall 20. The adhesive beads 74 can be made of any suitable adhesive. The adhesive need not be in the form of beads, but may be a ring of adhesive, or an adhesive layer covering part of or the entire outer surface 72. The adhesive may be applied in any suitable way to keep the patch 16 in place during the process described below.

[0031] In operation, the flexible container 14 is filled with contents (not shown) through the passageway 36. A separate dispenser (not shown) may cooperate with the passageway 36 to dispense the contents of the flexible container 14. The contents may also be dispensed through the passageway 36. The contents can include any suitable substance, including wine, dairy products, enteral feeding solutions, fruit

juices, tea and coffee concentrates, puddings, cheese sauces, low acid materials and many other flowable materials that can be contained in and dispensed from a flexible container and must be filled aseptically.

[0032] To fill the flexible container 14, the rupturable seal 64 is punctured, and the contents fill the flexible container 14 through the passageway 36. Figure 2 shows the fitment assembly 12, flexible container 14, and patch 16 after the flexible container 14 has been filled, and when it is being resealed. After filling, a heat sealer 78 is brought into contact with the patch 16. The heat sealer 78 is advanced until the inner surface 26 of the back wall 20 is brought into contact with the heat sealable membrane 50. Heat transferred from the heat sealer 78 causes the heat sealable membrane 50 to adhere to the back surface 48 of the base 38, thus resealing the passageway 36 of the flexible container 14 to retain the contents. The heat sealer 78 operates at approximately 180 ° C to 200 ° C, and is of any suitable type well known in the art. The patch 16 protects the back wall 20 from direct heat from the heat sealer 78 by absorbing heat that would otherwise have been directly absorbed by the back wall 20 of the flexible container 14, thereby insulating the back wall 20 from the heat sealer 78. This prevents compromising the integrity of the back wall 20 at the point where the heat sealer 78 meets the back wall 20.

[0033] The patch 16 also adds mechanical strength to the area of the flexible container 14 that contacts the heat sealer 78. The patch 16 preferably has at least the same surface area as the heat sealer 78. During heat sealing, the second layer 68 of the patch 16 and the back wall 20 melt, thereby sealing the second layer 68 and the back wall 20 together. The melting temperature of polyester is 250 ° C. The melting temperature of polyethylene is 105 ° C. The first layer 66 acts to hold together the back wall 20 and second layer 68. The second layer 68 also acts as a material reservoir, replacing any material squeezed from the back wall 20 to maintain structural integrity. The first layer 66 is preferably of a material that has a higher melting temperature than the second layer 68.

[0034] In another embodiment, the patch 16 is located within the flexible container 14, attached to the inner surface 26 of the back wall 20. Figure 6 shows the beads 74 of adhesive attaching the patch 16 to the inner surface 26 of the back wall 20 such that

it is opposite and in substantial registration with the opening 32 and flange 38 of the fitment assembly 12. In this embodiment, the patch 16 includes a first layer 80 and a second layer 82. The first layer 80 and second layer 82 preferably made of the same materials as the first layer 66 and second layer 68 of the embodiment described above. In this embodiment, the heat sealer 78 directly contacts the outer surface 28 of the back wall 20 of the flexible container 14. As in the above embodiment, the second layer 82 of the patch 16 acts a reservoir of material to replace any material squeezed out from pressure provided by the heat sealer 78. The first layer 80 maintains structural integrity of the patch 16.

[0035] In a further embodiment shown in Figure 7, the patch 16 is located between the inner surface 26 and outer surface 28 of the back wall 20. In this embodiment, the back wall 20 is preferably made of at least a two layered structure having a first layer 20a and second layer 20b. In a preferred embodiment, the first layer 20a and second layer 20b of the back wall 20 are both made of polyethylene. The patch 16 is located between the two layers 20a and 20b, in a position such that it is opposite and in substantial registration with the opening 32 and flange 38 of the fitment assembly 12.

[0036] The patch 16 of Figure 7 includes an inner layer 86 surrounded by a first outer layer 84 and a second outer layer 88. In a preferred embodiment, the inner layer 86 is metallized similar to metallized layer 73 described above, and the first outer layer 84 and second outer layer 88 are both of polyethylene. In another preferred embodiment, the inner layer 86 is of a polyamide such as nylon, and the first and second outer layers 84 and 88 are of polyethylene. In this embodiment, the heat sealer 78 directly contacts the outer layer 20b of the back wall 20. The first and second outer layers 84 and 88 are preferably of polyethylene, and act as a reservoir for materials squeezed out during melting by pressure from the heat sealer 78.

[0037] It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the present invention and without diminishing its intended advantages. It is therefore intended that such changes and modifications be covered by the appended claims.